LIBRARY FILE COPY
INTERMOUNTAIN STATION

NORTH CENTRAL FOREST EXPERIMENT STATION

Research Note NC-330

1992 FOLWELL AVE ST PAUL MN 55108 FOREST SERVICE-U.S.D.A.

1985

THE STATUS OF WHITE SPRUCE PLANTATIONS ON LAKE STATES NATIONAL FORESTS

Glen Erickson, *Forestry Technician,*
and **H. Michael Rauscher,** *Research Forester,*
Grand Rapids, Minnesota

ABSTRACT.--Summarizes information about white spruce plantations as of 1982. Based on average site index, the Superior National Forest in Minnesota and the Hiawatha and Huron-Manistee in Michigan contain climate-soil-seed source complexes that are, *on the average*, less productive for white spruce than on the other National Forests.

KEY WORDS: Acreage, site index, size-density classes, age classes.

The purpose of this paper is to summarize the norms and extremes of age, site index, size class, and percent stocking, as well as the size and location of white spruce (*Picea glauca* (Moench) (Voss)) plantations on National Forests in the Upper Great Lakes Region. This information is valuable as a guide for choosing plantations suitable for establishing research plots. It is also useful in forest management planning--how many acres will be available--for example.

White spruce plantations have been established in the Upper Great Lakes Region since the late 1920's. We knew very little about them until we summarized the information in this paper from the Timber Management Information System (TMIS) as of 1982. TMIS contains information on stands for every acre on the National Forests in the Upper Great Lakes Region. The records for white spruce plantations from other ownerships varied so greatly that they could not be used. However, we believe the plantations administered by the National Forests can be used to characterize all white spruce plantations in the region.

TMIS does not differentiate between planted and natural stands; therefore, a few natural stands are probably included in this summary. A random sample of 100 white spruce stands scattered through the Upper Great Lakes Region showed that 90 percent of those established since 1930 were planted. Because of our inability to identify the natural stands in the data base, we did not attempt to adjust the data and arbitrarily considered all stands established since 1930 to be of plantation origin.

LOCATIONS AND ACREAGES

Commercial forest land in the Lake States classed as white spruce forest cover type is estimated to be 233,200 acres (Jakes 1980, Spencer 1983, Spencer (personal communication)). More than 70 percent of this, or 166,482 acres is on National Forests in the Lake States, and about half of this (86,612 acres) is in plantations (table 1). The Superior National Forest has 37 percent of the white spruce plantation acreage, the Nicolet has 18 percent, the Chequamegon 17 percent, the Chippewa 12 percent, the Hiawatha 7 percent, the Ottawa 7 percent, and the Hurton-Manistee 1 percent.

The Tofte Ranger District on the Superior National Forest has the largest area of white spruce plantations of all districts with 10,207 acres, followed by the Isabella (7,564 acres), and Gunflint Ranger Districts (7,264 acres). The Tawas Ranger District on the Huron-Manistee National Forest has the least area--50 acres. The Superior National Forest has the most plantations (942); the Huron-Manistee National Forest the fewest (67). The Tofte Ranger District (Superior) has the most (277); the Tawas Ranger District (Huron-Manistee) the fewest (3).

Average Size

The average size plantation for all National Forests is 29 acres (range 1 to 299). The Superior National

Table 1.--*White spruce plantation summary by National Forest and district*

Districts	Plantations		Average[1]			Stand-size class			Stocking[2]		
	Total	Area	Area	Age	S.I.	Seedling-sapling	Pole timber	Saw timber	Low	Med.	High
	No.	*Acre*	*Acre*	*Years*	*Feet*		*- - - Percent[3] - - -*				
CHIPPEWA											
Blackduck	173	4,181	24	13	57	85	14	1	17	8	76
Cass Lake	66	1,769	27	9	61	97	3	0	35	18	47
Deer River	72	1,358	19	24	59	57	36	7	21	14	65
Marcell	67	1,643	25	11	63	87	12	1	46	7	46
Walker	81	1,556	19	16	63	77	23	0	44	10	46
All	459	10,507	23	14	60	81	17	2	29	11	60
SUPERIOR											
Aurora	163	4,156	25	25	55	72	28	0	15	28	58
Gunflint	168	7,264	43	16	52	88	10	2	14	26	60
Isabella	233	7,564	32	17	53	82	15	3	25	27	49
Kawishiwi	24	964	40	15	52	92	8	0	21	42	38
LaCroix	32	899	28	22	50	84	9	6	22	31	47
Tofte	277	10,207	37	12	50	94	4	1	32	32	36
Virginia	45	1,213	27	19	52	69	24	7	36	18	47
All	942	32,267	34	16	52	85	13	2	24	29	48
CHEQUAMEGON											
Glidden	157	4,921	31	27	60	59	37	4	3	17	80
Hayward	127	3,622	29	23	60	67	28	5	2	13	85
Medford	101	3,509	35	32	61	48	52	0	4	29	67
Park Falls	89	2,705	30	28	60	66	32	2	3	26	71
Washburn	5	78	16	26	53	80	20	0	0	80	20
All	479	14,834	31	27	60	60	37	3	4	21	76
NICOLET											
Eagle River	140	2,927	21	33	61	44	54	2	5	35	60
Florence	228	7,024	31	27	60	51	47	2	1	9	90
Lakewood	52	1,163	22	19	58	90	10	0	0	17	83
Laona	174	4,308	25	33	60	40	59	1	2	11	88
All	594	15,422	26	29	60	50	49	1	2	16	81
OTTAWA											
Bergland	8	341	43	36	60	50	38	13	25	0	75
Bessemer	58	1,882	32	22	59	64	29	7	18	22	60
Iron River	65	1,620	25	30	59	63	32	5	5	18	77
Kenton	20	444	22	23	53	85	15	0	0	45	55
Ontanogan	23	892	39	28	59	65	35	0	9	26	65
Watersmeet	42	1,137	27	23	59	64	36	0	3	14	83
All	216	6,316	29	26	59	65	31	4	8	21	70

(Table 1 continued

plantations have 70[1] percent or more stocking in white spruce, 20 percent (17,972 acres) have 40 to 69 percent stocking, and 15 percent (12,769 acres) have only 16 to 39 percent stocking.

SUMMARY

White spruce has been planted predominantly in northern Minnesota (49 percent of total acreage) and northern Wisconsin (35 percent of total acreage). Average plantation size is 29 acres; average age is 26 years with 74 percent of the plantation acreage less than 40 years of age. The age distribution is bimodal with modalities at 11 to 20 and 41 to 50 years. Only 30 percent of the plantation acreage is in the poletimber or sawtimber size classes but 85 percent have at least 40 percent of the overstory component in white spruce. The average site index is 56 (range 20 to 85) with 70 percent of the sites between 50 and 69 feet.

Based on the average site index, it seems that the Superior National Forest in Minnesota, and the Hiawatha and Huron-Manistee National Forests in Michigan contain climate-soil-seed source complexes that are, *on the average*, less productive than those on the Chippewa, Nicolet, Chequamegon, and the Ottawa National Forests. In the case of the Superior we suspect macro-climate and poor local seed sources as the reasons for poor performance. The Hiawatha and Huron-Manistee contain extensive acreages of droughty sites which may retard productivity.

[1]*A stocking percent of 100 indicates full utilization of the site. In this report 70 percent or more is considered "high," 40-69 percent "medium," and 16-39 percent "low."*

LITERATURE CITED

Gevorkiantz, S. R. Site index curves for white spruce in the Lake States. Tech. Note 474. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station; 1957. 2 p.

Jakes, Pamela J. The fourth Minnesota forest inventory: area. Resour. Bull. NC-54. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1980. 37 p.

Spencer, John S., Jr. Michigan's fourth forest inventory: area. Resour. Bull. NC-68. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1983. 39 p.

State of Wisconsin. A coniferous plantation survey. Madison, WI: Department of Natural Resources; 1980. 11 p. *unpublished.*

☆U.S. GOVERNMENT PRINTING OFFICE: 1985-566-366

the youngest average age (9 years) with the oldest average age (36 years) on the Bergland Ranger District (Ottawa National Forest).

The two major planting periods for white spruce occurred during the Civilian Conservation Corps Program in the 1930's and the Accelerated Public Works Program in the 1960's (fig. 1). Evidence of these two planting periods shows up both on National Forests and in Wisconsin Department of Natural Resources (DNR) plantations. Region-wide on National Forests, 52,089 acres of plantations (60 percent) are less than 20 years old, and 22,748 acres (26 percent) are 41 and 50 years old (fig. 1). For Wisconsin DNR plantations, 59 percent are less than 20 years old, and 18 percent are 41 to 50 years old (State of Wisconsin 1980).

Site Index

The overall average site index (S.I.) (base age 50 using Gevorkiantz 1957) for white spruce on the National Forests is 56 (range 20 to 85) with the Chippewa, Chequamegon, and Nicolet National Forests having the highest (60) and the Huron-Manistee the lowest average (51) (fig. 2). Marcell and Walker Ranger Districts (Chippewa National Forest) both have the highest average S.I. (63); the lowest (46) is on the Harrisville Ranger District Huron-Manistee National Forest). All districts on the Superior, Hiawatha (except Sault Ste. Marie Ranger District), and Huron-Manistee National Forests (except Cadillac Ranger District), are below the regional average. Grouping S.I. into 10 foot classes (fig. 3) shows that 70 percent of

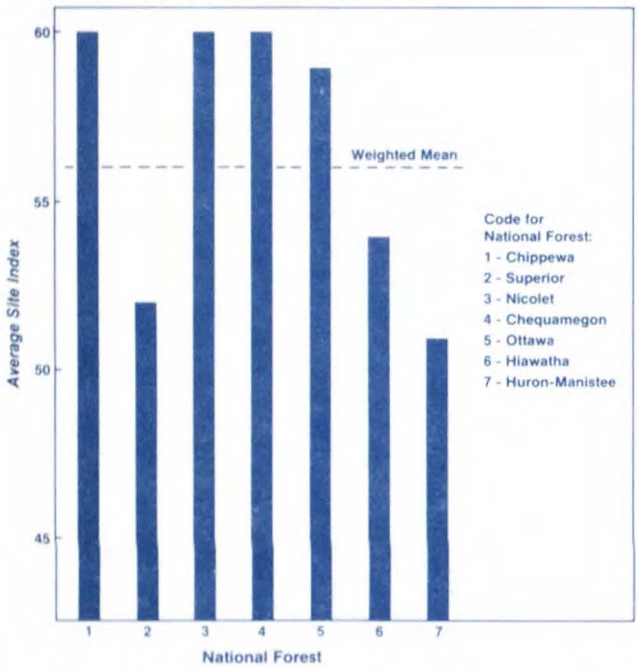

Figure 2.--*Average site index of white spruce plantations by National Forest in the Lake States.*

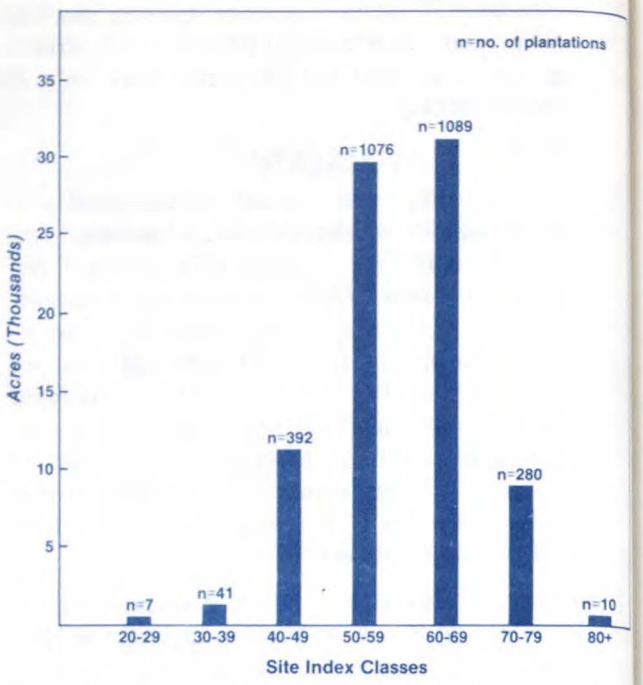

Figure 3.--*Site index distribution of white spruce plantations on National Forests in the Lake States by acreage and number (base age 50 using Gevorkiantz 1957).*

all the plantation acreage is in two classes--the 50- to 59-foot class (29,798 acres, 34 percent) and the 60- to 69-foot class (30,959 acres, 36 percent).

Size Classes and Stocking

Most plantation acreage (70 percent, 60,426 acres) is still in seedling-sapling size classes (0-5 inches d.b.h.). The poletimber size class (5-9 inches d.b.h.) occupies 28 percent (24,574 acres); and sawtimber (9+ inches d.b.h.) 2 percent (1,612 acres) (fig. 4).

For all size classes, 65 percent (55,871 acres) of the

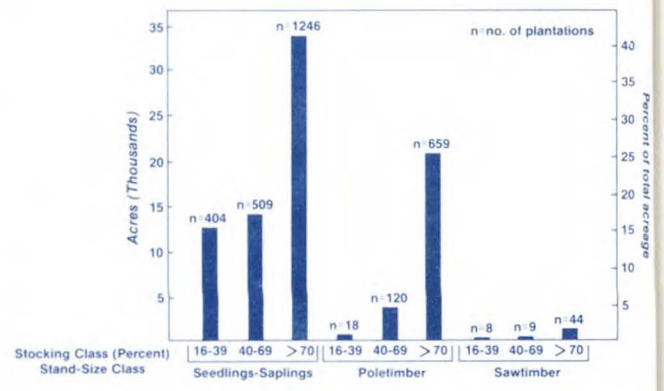

Figure 4.--*Size density distribution of white spruce plantations on National Forests in the Lake States by acreage, percent and number.*

(Table 1 continued)

Districts	Plantations		Average[1]			Stand-size class			Stocking[2]		
	Total	Area	Area	Age	S.I.	Seedling-sapling	Pole timber	Saw timber	Low	Med.	High
	No.	*Acre*	*Acre*	*Years*	*Feet*		*Percent[3]*				
HIAWATHA											
Manistique	45	887	20	17	54	96	4	0	13	24	62
Munising	26	607	23	34	54	38	58	4	19	23	58
Rapid River	90	2,206	25	24	52	80	18	2	8	29	63
Slt. Ste. Marie	57	1,868	33	20	56	89	11	0	4	21	75
St. Ignace	42	770	18	22	51	76	24	0	14	7	79
All	260	6,338	24	23	54	80	19	1	10	22	68
HURON-MANISTEE											
Baldwin	8	59	7	21	48	100	0	0	0	0	100
Cadillac	27	335	12	23	58	89	11	0	0	11	89
Harrisville	9	182	20	19	46	89	11	0	11	56	33
Mio	17	205	12	24	48	88	12	0	18	53	29
Tawas	3	50	17	35	48	67	33	0	0	67	33
White Cloud	5	97	19	27	49	60	40	0	0	60	40
All	67	928	14	23	51	87	13	0	6	33	61
TOTAL (All NF's)	3,017	86,612	29	23	56	72	26	2	15	21	64

[1]National Forest averages are weighted by total acres.

[2]A stock percent of 100 indicates full utilization of the site. In this report 70 percent or more is considered "high," 40-69 percent "medium," and 16-39 percent "low."

[3]National Forest percentages are weighted by number of plantations.

Forest averages 34 acres per plantation, (the largest); the Huron-Manistee National Forest averages 14 acres per plantation (the smallest). The Gunflint Ranger District (Superior National Forest) has the largest size plantation (average 43 acres), and the Baldwin Ranger Distrct (Huron-Mainstee National Forest) the smallest (average 7 acres).

Numbers and Ages

Over the last ten years 744 plantations (21,077 acres) were established, amounting to 24 percent of the total (fig. 1). The Superior National Forest has 333 (45 percent) of 10-year and younger plantations (11,851 acres) followed by the Chippewa with 241 (5,158 acres), the Chequamegon 59 (1,382 acres), the Nicolet 37 (988 acres), the Ottawa 36 (867 acres), the Hiawatha 29 (725 acres), and the Huron-Manistee National Forest 9 (106 acres).

The average age of white spruce plantations in the Lake States is 23 years (table 1) with the Chippewa National Forest having the youngest (14 years) and the Nicolet National Forest the oldest (29 years). Cass Lake Ranger District (Chippewa National Forest) has

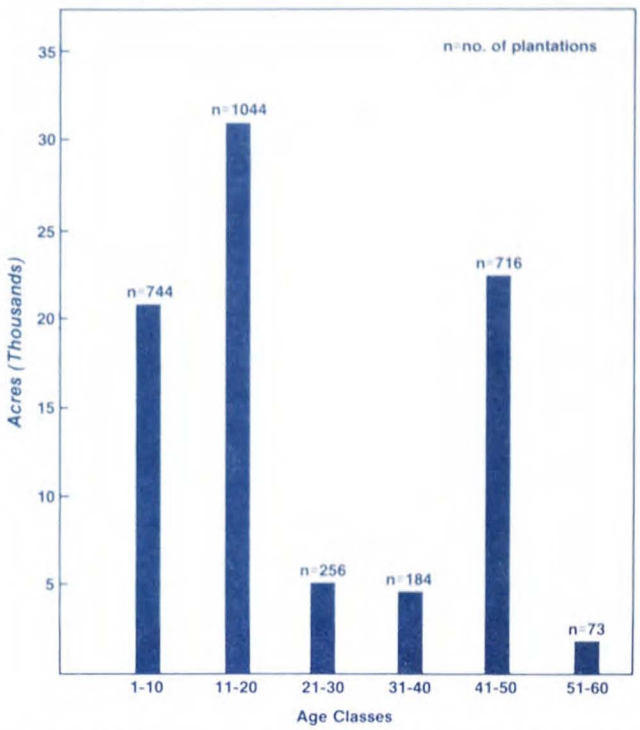

Figure 1.--*Age class distribution of white spruce plantations on National Forests in the Lake States by acreage and number.*